CLAIMS

1. Use of a PDE4 inhibitor compound from the pyrazolopyridine family for preparing a pharmaceutical composition intended to increase neuron survival in patients with neurodegenerative ocular diseases.

2. Use according to claim 1, for preparing a pharmaceutical composition intended to inhibit or reduce neuron death due to excitotoxicity during neurodegenerative ocular diseases.

3. Use according to claim 1, characterized in that the compound is also a ligand of the peripheral benzodiazepine receptor (PBR).

4. Use according to claim 1 or 3, characterized in that the compound is also a ligand of GABA receptors of the type GABA(A).

5. Use according to claim 1, characterized in that the compound is selected in the group consisting of etazolate and tracazolate, preferably etazolate.

6. Use according to claim 1, characterized in that the compound is selected in the group consisting of the following compounds :

4-butylamino-1-ethyl-1*H*-pyrazolo[3,4-*b*]pyridine-5-carboxylic acid ethyl ester,

1-(4-amino-pyrazolo[3,4-*b*]pyridin-1-yl)-β-*D*-1-deoxy-ribofuranose,

1-ethyl-4-(N'-isopropylidene-hydrazino)-1H-pyrazolo[3,4-b]pyridine-5-carboxylic acid ethyl ester (SQ 20009),

4-amino-6-methyl-1-n-pentyl-1H-pyrazolo[3,4-b]pyridine,

4-amino-1-ethyl-6-methyl-1H-pyrazolo[3,4-b]pyridine-5-carboxylic acid ethyl ester (desbutyl tracacolate),

4-amino-1-pentyl-1H-pyrazolo[3,4-b]pyridine-5-carboxamide,

1-ethyl-6-methyl-4-methylamino-1*H*-pyrazolo[3,4-*b*]pyridine-5-carboxylic acid ethyl ester,

4-amino-6-methyl-1-propyl-1*H*-pyrazolo[3,4-*b*]pyridine-5-carboxylic acid ethyl ester,

1-ethyl-4-ethylamino-6-methyl-1*H*-pyrazolo[3,4-*b*]pyridine-5-carboxylic acid ethyl ester,

4-amino-1-butyl-6-methyl-1*H*-pyrazolo[3,4-*b*]pyridine-5-carboxylic acid ethyl ester,

5-(4-amino-pyrazolo[3,4-*b*]pyridin-1-yl)-2-hydroxymethyl-tetrahydro-furan-3-ol,

1-allyl-4-amino-6-methyl-1*H*-pyrazolo[3,4-*b*]pyridine-5-carboxylic acid allyl ester,

4-amino-6-methyl-1-pentyl-1*H*-pyrazolo[3,4-*b*]pyridine-5-carboxylic acid,

4-amino-1-ethyl-3,6-dimethyl-1*H*-pyrazolo[3,4-*b*]pyridine-5-carboxylic acid ethyl ester,

4-dimethylamino-1-ethyl-6-methyl-1*H*-pyrazolo[3,4-*b*]pyridine-5-carboxylic acid ethyl ester,

1-ethyl-6-methyl-4-propylamino-1*H*-pyrazolo[3,4-*b*]pyridine-5-carboxylic acid ethyl ester,

4-amino-1-pentyl-1*H*-pyrazolo[3,4-*b*]pyridine-5-carboxylic acid ethyl ester,

4-amino-6-methyl-1-pent-4-ynyl-1H-pyrazolo[3,4-b]pyridine-5-carboxylic acid ethyl ester,

4-amino-1-but-3-enyl-1*H*-pyrazolo[3,4-*b*]pyridine-5-allylamide,

4-amino-1-pentyl-1*H*-pyrazolo[3,4-*b*]pyridine-5-isopropylamide,

4-amino-1-pentyl-N-n-propyl-1H-pyrazolo-[3,4-b]pyridine-5-carboxamide,

4-amino-1-butyl-6-methyl-1*H*-pyrazolo[3,4-*b*]pyridine-5-carboxylic acid allyl ester,

4-amino-6-methyl-1-pent-3-ynyl-1*H*-pyrazolo[3,4-*b*]pyridine-5-carboxylic acid ethyl ester,

4-amino-1-pentyl-1*H*-pyrazolo[3,4-*b*]pyridine-5-prop-2-ynylamide,

4-amino-1-(3-methyl-butyl)-1*H*-pyrazolo[3,4-*b*]pyridine-5-carboxylic acid allyl ester,

4-amino-1-pentyl-1H-pyrazolo<3,4-b>pyridine-5-N-(2-propenyl)carboxamide,

4-amino-1-pentyl-1*H*-pyrazolo[3,4-*b*]pyridine-5-carboxylic acid allyl ester,

4-amino-1-pentyl-1*H*-pyrazolo[3,4-*b*]pyridine-5-butylamide,

4-amino-1-but-3-ynyl-6-methyl-1*H*-pyrazolo[3,4-*b*]pyridine-5-carboxylic acid allyl ester,

4-amino-1-but-3-enyl-6-methyl-1*H*-pyrazolo[3,4-*b*]pyridine-5-carboxylic acid allyl ester,

4-amino-6-methyl-1-pentyl-1*H*-pyrazolo[3,4-*b*]pyridine-5-allylamide,

4-amino-6-methyl-1-pentyl-1H-pyrazolo[3,4-b]pyridine-5-carboxylic acid allyl ester,

4-amino-6-methyl-1-(3-methyl-butyl)-1*H*-pyrazolo[3,4-*b*]pyridine-5-carboxylic acid allyl ester,

4-amino-6-methyl-1-pentyl-1*H*-pyrazolo[3,4-*b*]pyridine-5-carboxylic acid isobutyl ester,

4-amino-6-methyl-1-pentyl-1*H*-pyrazolo[3,4-*b*]pyridine-5-butylamide,

4-amino-6-methyl-1-(3-methyl-but-2-enyl)-1*H*-pyrazolo[3,4-*b*]pyridine-5-carboxylic acid allyl ester,

4-amino-1-pentyl-1*H*-pyrazolo[3,4-*b*]pyridine-5-cyclopropylamide,

ethyl 4-amino-1-pentyl-1H-pyrazolo[3,4-b]pyridine-5-hydroxamate,

4-amino-6-methyl-1-pentyl-1*H*-pyrazolo[3,4-*b*]pyridine-5-carboxylic acid prop-2-ynyl ester,

4-amino-6-methyl-1-pent-4-ynyl-1*H*-pyrazolo[3,4-*b*]pyridine-5-carboxylic acid allyl ester,

4-amino-6-methyl-1-pent-4-enyl-1*H*-pyrazolo[3,4-*b*]pyridine-5-carboxylic acid allyl ester,

4-amino-1-pent-3-ynyl-1*H*-pyrazolo[3,4-*b*]pyridine-5-propylamide,

4-amino-1-pentyl-1*H*-pyrazolo[3,4-*b*]pyridine-5-cyclopropylmethyl-amide,

4-amino-6-methyl-1-pentyl-1*H*-pyrazolo[3,4-*b*]pyridine-5-carboxylic acid 2-methyl-allyl ester,

4-amino-1-pent-3-ynyl-1H-pyrazolo[3,4-b]pyridine-5-allylamide (ICI 190,622),

4-amino-1-pent-4-ynyl-N-2-propenyl-1H-pyrazolo[3,4-b]pyridine-5-carboxamide,

4-amino-1-pent-3-ynyl-1*H*-pyrazolo[3,4-*b*]pyridine-5-prop-2-ynylamide,

4-amino-1-pentyl-1*H*-pyrazolo[3,4-*b*]pyridine-5-but-2-ynylamide,

4-amino-6-methyl-1-pent-3-ynyl-1*H*-pyrazolo[3,4-*b*]pyridine-5-carboxylic acid allyl ester,

4-amino-1-(2-cyclopropyl-ethyl)-6-methyl-1*H*-pyrazolo[3,4-*b*]pyridine-5-carboxylic acid allyl ester,

4-amino-1-hex-5-ynyl-6-methyl-1*H*-pyrazolo[3,4-*b*]pyridine-5-carboxylic acid allyl ester,

4-amino-1-pent-3-ynyl-1*H*-pyrazolo[3,4-*b*]pyridine-5-cyclopropylmethyl-amide,

4-amino-6-methyl-1-pentyl-1*H*-pyrazolo[3,4-*b*]pyridine-5-carboxylic acid but-3-enyl ester,

4-amino-6-methyl-1-pentyl-1H-pyrazolo[3,4-b]pyridine-5-carboxylic acid cyclopropylmethyl ester,

4-butylamino-1-pentyl-1*H*-pyrazolo[3,4-*b*]pyridine-5-allylamide,

4-amino-6-methyl-1-pentyl-1*H*-pyrazolo[3,4-*b*]pyridine-5-carboxylic acid 2-cyclopropyl-ethyl ester,

4-amino-6-methyl-1-pent-3-ynyl-1*H*-pyrazolo[3,4-*b*]pyridine-5-carboxylic acid cyclopropylmethyl ester,

4-amino-6-methyl-1-pent-4-ynyl-1*H*-pyrazolo[3,4-*b*]pyridine-5-carboxylic acid cyclopropylmethyl ester,

4-amino-1-benzyl-6-methyl-1*H*-pyrazolo[3,4-*b*]pyridine-5-carboxylic acid ethyl ester,

4-amino-1-pentyl-1*H*-pyrazolo[3,4-*b*]pyridine-5-benzylamide,

4-amino-1-pentyl-1*H*-pyrazolo[3,4-*b*]pyridine-5-phenylamide,

4-amino-6-methyl-1-pentyl-1*H*-pyrazolo[3,4-*b*]pyridine-5-carboxylic acid benzyl ester,

4-azido-1-β-D-ribofuranosylpyrazolo[3,4-b]pyridine,

1-pent-3-ynyl-N-2-propenyl-4-propionamido-1H-pyrazolo[3,4-b]pyridine-5-carboxamide,

2-(4-amino-pyrazolo[3,4-*b*]pyridin-1-yl)-5-hydroxymethyl-tetrahydro-furan-3,4-diol,

2-(6-methyl-1*H*-pyrazolo[3,4-*b*]pyridin-4-ylamino)-ethanol,

3-(6-methyl-1*H*-pyrazolo[3,4-*b*]pyridin-4-ylamino)-propan-1-ol,

3-(6-methyl-1*H*-pyrazolo[3,4-*b*]pyridin-4-ylamino)-acetic acid propyl ester,

2-(6-methyl-1*H*-pyrazolo[3,4-*b*]pyridin-4-ylamino)-propionic acid ethyl ester,

2-(6-methyl-1*H*-pyrazolo[3,4-*b*]pyridin-4-ylamino)-pentanoic acid ethyl ester,

2-(6-methyl-1*H*-pyrazolo[3,4-*b*]pyridin-4-ylamino)-benzoic acid ethyl ester,

3-(6-methyl-1*H*-pyrazolo[3,4-*b*]pyridin-4-ylamino)-pentanoic acid propyl ester,

N-benzylidene-*N'*-(3-methyl-1-phenyl-1*H*-pyrazolo[3,4-*b*]pyridin-4-yl)-hydrazine,

N-furan-2-ylmethylene-*N'*-(3-methyl-1-phenyl-1*H*-pyrazolo[3,4-*b*]pyridin-4-yl)-hydrazine,

N-(4-fluoro-benzylidene)-*N'*-(3-methyl-1-phenyl-1*H*-pyrazolo[3,4-*b*]pyridin-4-yl)-hydrazine,

N-(3-furan-2-yl-allylidene)-*N'*-(3-methyl-1-phenyl-1*H*-pyrazolo[3,4-*b*]pyridin-4-yl)-hydrazine,

N-(4-methoxy-benzylidene)-*N'*-(3-methyl-1-phenyl-1*H*-pyrazolo[3,4-*b*]pyridin-4-yl)-hydrazine,

4-[(3-methyl-1-phenyl-1*H*-pyrazolo[3,4-*b*]pyridin-4-yl)-hydrazonomethyl]-benzonitrile,

N-benzo[1,3]dioxol-5-ylmethylene-*N'*-(3-methyl-1-phenyl-1*H*-pyrazolo[3,4-*b*]pyridin-4-yl)-hydrazine,

N-(3-methyl-1-phenyl-1*H*-pyrazolo[3,4-*b*]pyridin-4-yl)-*N'*-(4-nitro-benzylidene)-hydrazine,

N-(3-methyl-1-phenyl-1*H*-pyrazolo[3,4-*b*]pyridin-4-yl)-*N'*-(2-nitro-benzylidene)-hydrazine,

N-(3-methyl-1-phenyl-1*H*-pyrazolo[3,4-*b*]pyridin-4-yl)-*N'*-(4-trifluoromethyl-benzylidene)-hydrazine,

N-(3-methyl-1-phenyl-1*H*-pyrazolo[3,4-*b*]pyridin-4-yl)-*N'*-(5-nitro-furan-2-ylmethylene)-hydrazine,

N-(3-methyl-1-phenyl-1*H*-pyrazolo[3,4-*b*]pyridin-4-yl)-*N'*-(2-trifluoromethyl-benzylidene)-hydrazine,

N-(3-methyl-1-phenyl-1*H*-pyrazolo[3,4-*b*]pyridin-4-yl)-*N'*-(6-nitro-benzo[1,3]dioxol-5-ylmethylene)-hydrazine,

4-(3-chloro-4-methoxy-benzylamino)-1-ethyl-1*H*-pyrazolo[3,4-*b*]pyridine-5-carboxylic acid,

4-(3-chloro-4-methoxy-benzylamino)-1-ethyl-1*H*-pyrazolo[3,4-*b*]pyridine-5-(pyridin-4-ylmethyl)-amide,

4-(3-chloro-4-methoxy-benzylamino)-1-ethyl-1*H*-pyrazolo[3,4-*b*]pyridine-5-(tetrahydro-furan-2-ylmethyl)-amide,

4-(3-chloro-4-methoxy-benzylamino)-1-ethyl-1*H*-pyrazolo[3,4-*b*]pyridine-5-(5-hydroxy-pentyl)-amide,

4-(3-chloro-4-methoxy-benzylamino)-1-ethyl-1*H*-pyrazolo[3,4-*b*]pyridine-5-[3-(2-oxo-pyrrolidin-1-yl)-propyl]-amide,

4-*tert*-butylamino-1-(2-chloro-2-phenyl-ethyl)-1*H*-pyrazolo[3,4-*b*]pyridine-5-carboxylic acid ethyl ester,

1-(2-chloro-2-phenyl-ethyl)-4-cyclopropylamino-1*H*-pyrazolo[3,4-*b*]pyridine-5-carboxylic acid ethyl ester,

1-(2-chloro-2-phenyl-ethyl)-4-propylamino-1*H*-pyrazolo[3,4-*b*]pyridine-5-carboxylic acid ethyl ester,

1-(2-chloro-2-phenyl-ethyl)-4-phenylamino-1*H*-pyrazolo[3,4-*b*]pyridine-5-carboxylic acid ethyl ester,

4-butylamino-1-(2-chloro-2-phenyl-ethyl)-1*H*-pyrazolo[3,4-*b*]pyridine-5-carboxylic acid ethyl ester,

1-(2-chloro-2-phenyl-ethyl)-4-(2-ethoxy-ethylamino)-1*H*-pyrazolo[3,4-*b*]pyridine-5-carboxylic acid ethyl ester,

4-benzylamino-1-(2-chloro-2-phenyl-ethyl)-1*H*-pyrazolo[3,4-*b*]pyridine-5-carboxylic acid ethyl ester, and

1-(2-chloro-2-phenyl-ethyl)-4-phenethylamino-1*H*-pyrazolo[3,4-*b*]pyridine-5-carboxylic acid ethyl ester.

7. Use according to claim 1, characterized in that the compound is an antisense nucleic acid capable of inhibiting the transcription of the PDE4B gene or the translation of the corresponding messenger.

8. Use according to any one of the previous claims, for preparing a pharmaceutical composition intended to increase neuron survival in patients with retinal degeneration.

9. Use according to any one of the previous claims, for preparing a pharmaceutical composition intended to increase neuron survival in patients with retinitis pigmentosa, age-related macular degeneration, the retinal effects of glaucoma or a retinopathy.

10. Use of etazolate for preparing a pharmaceutical composition intended for the treatment of neurodegenerative ocular diseases.

11. Use of etazolate for preparing a pharmaceutical composition intended to increase neuron survival in patients with neurodegenerative ocular diseases.

12. Use of etazolate for preparing a pharmaceutical composition intended to inhibit or reduce neuron death due to excitotoxicity in patients with neurodegenerative ocular diseases.

13. Use according to any one of claims 10 to 12, characterized in that the neurodegenerative ocular disease is retinitis pigmentosa.

14. Use according to any one of claims 10 to 12, characterized in that the neurodegenerative ocular disease is age-related macular degeneration.

15. Use according to any one of claims 10 to 12, characterized in that the neurodegenerative ocular disease is the effect on retinal neurons of the presence and the evolution of glaucoma.

16. Use according to any one of claims 10 to 12, characterized in that the neurodegenerative ocular disease is a retinopathy.

17. Use according to any one of claims 10 to 16, characterized in that etazolate is administered in oral form.

18. Pharmaceutical composition comprising a compound selected in the group consisting of etazolate and tracazolate, and a pharmaceutically acceptable excipient and allowing retro- and/or intra-ocular administration.

19. Method for detecting a situation of excitotoxicity or neuronal stress in a subject, comprising measuring *in vitro* the expression of AKAP1 and/or GABA(A)RAPL1 in a sample from the subject, or detecting the presence of a mutant form of AKAP1 and/or GABA(A)RAPL1 RNA in said sample.

20. Method for the selection, identification or characterization of compounds active on pathologies related to excitotoxicity, or neuronal stress, particularly neurodegenerative ocular pathologies, comprising contacting test compounds with PDE4B (in particular a variant devoid of the 3' non-coding region), AKAP1 and/or GABA(A)RAPL1, or with a cell expressing same, and demonstrating compounds binding to said protein or inhibiting the expression or activity of said protein.